BUILDING A CAMPUS STATION IN WAR TIME

Since the start of the war it has been relatively difficult to establish a campus radio station. As a result, the number of stations in IBS has remained essentially constant, and even a few stations have found it necessary to close.

Recently, conditions for establishing a station have grown more favorable, as evidenced by the recent opening of a station at Bucknell, and the reopening of the stations at Wesleyan and Princeton, both of which had been forced off the air because of reduced student operating personnel.

As can be imagined, the two main problems to be solved when establishing a campus station are obtaining the equipment needed, and finding students having the time and ability to make the installation and produce the broadcasts. The existance of IBS proves that the students are available. At most schools there are engineering and other science major students, and these are the ones who greatly help with building the station. Also, it has become apparent that it is possible to produce interesting daily programs with much less effort than is required, for instance, to publish a daily campus newspaper. The result has been that campus stations have maintained two or three hour daily schedules at colleges where the daily paper has had to curtail its publication to one issue a week, or even disband for the duration.

-Required Facilities and Equipment-

The following basic facilities and equipment are required to start a campus station:

1. Space for studio and control room.
2. Studio equipment.
3. Transmitter.
4. Transmission system.

-Studio and Control Room-

In the most simple installation, the studio and control room can be combined. This arrangement limits the flexibility of the station, and makes it difficult to produce other than record shows and talks by one or a few persons. The more preferable arrangement is to partition off the control room, providing it with a floor raised about 16 inches above the studio floor, and a double glass window through which the control operator can observe the program. More elaborate stations also provide a viewing window for an audience, and more than one studio. One control room can be arranged to service two or three studios, or each studio can be arranged with its own control room, in which case master control facilities are required to combine the output of the various studios before the program reaches the transmitter. It is obvious that these more elaborate arrangements offer many advantages, such as rehearsals during broadcast time, but they can be added later.

-Studio Treatment-

It must be remembered that a studio is not just a room with some microphones. If undesirable echos, or reverberations are to be avoided, the studio walls, ceiling and floor must be treated with sound absorbing material. Again, an elaborate installation is not needed to be effective. Drapes of monk's cloth on the walls, a false ceiling of cheese cloth supported by lathe, and a carpet on the floor, can be used to good advantage. One wall of the studio should be left without treatment. Movable flats or "gobo" boards built of sound absorbing material to cover as much of this wall as required. Experimentation with placement of microphones, gobo boards and actors will quickly show what studio arrangement will give a program having enough "live" quality to satisfying, and yet not result in excessive reverberation.

-Studio Equipment-

Minimum studio equipment required is as follows:

1. At least two microphones, one with floor stand, and other with table stand or combination floor and table stand.

2. At least two 78 rpm. phonograph turntables with pickups. Turntable diameter may be eight inches for commercial recordings up to twelve inches.

* 3. If at all possible, one 33 1/3 rpm. transcription table with pickup, for up to 16 inch diameter lateral cut transcriptions

4. Studio control console, or mixer, having at least four channels. These channels should preferably permit mixing or blending four inputs simultaneously. Two channels should provide gain adequate for the microphones, the other two should be suitable for the phonograph pickups. By means of switches or jacks the phonograph channels should be arranged to connect and alternate inputs, such as the transcription pickup.

5. Telephone headset or earphones to monitor the program.

6. Volume level meter to monitor the program.

* 7. Separate amplifier with speaker to monitor the program. If the transmitter can be received in the studio, this may be a good quality radio. If there is danger of feedback between the monitor speaker and the microphones, an automatic switching circuit must be installed to turn off the speaker when the microphones are switched on.

* 8. FM tuner for relaying FM programs. This is fed into the mixer in place of one of the phonographs.

* 9. Line matching unit to connect remote line to mixer for remote programs. This, too, is connected into the mixer in place of one of the phonographs.

*10. Remote Pickup equipment, control room-to-studio talkback circuit, and other refinements.

-Microphones and Phonographs-

Public address type microphones, phonograph turntables and pickups can be used to start a station, and often can be obtained by canvasing students, the local radio supply dealers, and others. Later, better units should be purchased when possible. Most of the microphones so obtained will be of the high impedance variety, but in planning station growth the fact should be kept in mind that low impedance microphones are best because of reduced microphone cable maintenance and longer permissible microphone cable lengths, in spite of their greater initial cost and the need for a matching transformer between the microphone cable and the grid of the preamplifier tube.

Phonograph turntables and pickups are difficult to find, and the less expensive turntables will be a frequent source of trouble since they are not designed for the broadcasting duty. "Permanent" needle pickups are not recommended because their life is relatively short in broadcasting service. It is better to put up with the bother of changing needles, than have to purchase a new cartridge, or return the old one to the manufacturerer every three or four months. If necessary it is possible to convert some permanent stylus type pickups to the type with removable needle.

Unfortunately, the transcription turntable will be quite difficult to find, but diligent searching will be rewarded because of the increased field of program material the 33 1/3 speed makes possible. Sometimes college stations arrange to borrow transcriptions from local stations, and IBS releases transcribed programs from time to time.

-Studio Console-

The studio console can be made by the student technicians or may be converted from a public address amplifier.

Unfortunately, there are relatively few public address amplifiers having the desired number of input controls and which do not have a power output far in excess of the needs of the station. Nevertheless, a high powered public address amplifier can be modified for studio use in one of the following ways:

1. Utilize audio output to modulate the transmitter. In general, the amplifier should be operated at about half rated power, as a compromise between too much disbortion at rated power level, and excessive hum at low power levels. If this optimum power level is greater than required to modulate the transmitter, it must be reduced by resistance attenuators, or pads. Also, since most public address amplifiers have an output of 500 or 600 Ohms, a matching transformer will be required to correctly modulate the transmitter.

* These units are not needed for the most simple record type shows, and so can be added as the need arises.

2. Utilize audio output to feed remote line to transmitter. In this case the impedance level of 500 or 600 ohms is all right for the line, but a resistance attenuator capable of reducing the power across the line to .006 watts is required.

3. Utilize the audio output to operate the studio monitor speaker. Attenuation in power output will be required, because about one watt is all that is required for the studio speaker. It will also be necessary to provide a speaker cut-out switch or relay, as previously described.

4. Rebuild the amplifier to eliminate the output stage, or reduce the power output to the desired value for one of the above uses be substituting smaller tubes. In this event, care must be taken not to cause the power supply voltage to increase on the other stages, since instability or failure of parts from high voltage may result.

Instructions for building studio console equipment can be found in radio magazines, of may be obtained from the IBS Technical Department. However, since it will be necessary to construct the transmitter for the station, it may prove less difficult to start broadcasting with a modified public address amplifier, and build specially designed studio console later.

-Earphone Monitor-

The telephone headset can be connected into the circuit at any point where suitable volume is obtained, the only requirement being that no adjustment of the program level or addition of program material takes place after the point where the earphones are connected.

-Volume Indicator-

Many public address amplifiers are equipped with a volume indicator meter. A standard VU meter is the preferable type, but any meter calibrated in db. can be used. If no meter is available, a vacuum tube rectifier can be used to rectify audio voltage and drive a sensitive d-c milliameter or a tuning indicator tube can be driven from the same type of rectifier. Some visual, calibrated, indication of program level is mandatory if distortion from overmodulation, or wide variations in program level are not to result.

-Transmitter-

It will not be possible to buy a small broadcast transmitter and so one must be built. From circuits available from the IBS Technical Department it is possible to choose a design which will adequately cover any given campus or building. As a rule, a transmitter having a radio frequency output of about five watts is adequate. A transmitter of this size can be constructed from radio receiver components, and so is within the realm of possibility no matter how scarce material

are. If several good a-c operated radios can be obtained for the project, they will generally yield enough parts for power supply, modulator, tuning capacitors and coils for the radio frequency stages, and so forth. The IBS Technical Department will be glad to draw up special circuits of transmitters utilizing parts obtained in this manner.

-Transmission System-

Of the many transmission schemes available to the college broadcaster, the one which has proved most reliable and least likely to cause interference from radiation is a network of overhead or underground twisted pair lines feeding power from a transmitter to the 110/220 volt lighting circuits in the buildings to be reached. The line is coupled into the a-c circuilt in each building near the fuse box through fuses and blocking capacitors rated between 0.01 to 0.006 mfd., 500 or more volts. This system provides good coverage throughout each building. If required, a licensed electrician can easily make the required connections.

The main problem will be with obtaining wire. A twisted pair conductor is required to prevent radiation, and if an overhead installation is required, it must be weather resistant wire. A possible source of wire is the local power or telephone company, who might donate used wire which could be salvaged by cutting out the worse sections and splicing. In similar fashion, the campus buildings and grounds department might have scrap wire. Indoor extension cord wire can be used if nothing else can be found, but most types will not long withstand outdoor weather conditions. If the campus is equipped with steam tunnels the lines should be installed in them, since a reduction in line maintenance and radiation of radio frequency energy from the line will result.

-Future Growth-

If, by exercising ingenuity and effort along the lines described above, it proves feasable to start a station of demonstrative worth to the college community, maintenance priority rating can be obtained. This priority will permit the purchase of more suitable equipment and materials to take the place of the initially installed apparatus. This priority can be obtained with the help of the college buildings and grounds department, who have a similar one for the maintenance of the campus facilities.

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